

REMARKS

In the present Amendment, claim 2 has been amended to improve its form. Claims 4 and 7 are amended to depend from any one of claims 1, 2 and 8, and claim 6 is amended to depend solely on claim 4. Claim 3 has been cancelled.

Claim 8 has been added as shown above. Support for this claim can be found at, for example, page 20, lines 12-16 of the present specification.

Claim 9 has been added. Support for claim 9 can be found at, for example, page 11, lines 14-20.

Claim 10 has been added. Support for claim 10 can be found at, for example, page 11, lines 14-20 of the present specification.

Claim 11 has been added. Support for claim 11 can be found at, for example, page 23, lines 3-7.

Claim 12 has been added. Support for claim 12 can be found at, for example, page 20, lines 12-17 of the present specification.

Claim 13 has been added. Support for claim 13 can be found at, for example, page 11, lines 14-20 of the present specification.

Claim 14 has been added. Support for claim 14 can be found at, for example, page 11, lines 14-20 of the present specification.

Claim 15 has been added. Support for claim 15 can be found at, for example, original claim 5 and page 9, lines 10-15.

Claim 16 has been added. Support for claim 16 can be found at, for example, original claim 6 and page 9, lines 17-21.

In Paragraph No. 6 of the Action, claims 1-7 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Fujikawa et al (WO 03/000410) (“Fujikawa”) in view of Choca (U.S. Patent No. 4,066,572).

In the Office Action, the Examiner basically asserts that Fujikawa discloses most of the limitations of the present claims. However, the Examiner concedes that “the reference does not appear to explicitly disclose that the catalyst support contains a phosphorous oxide in an amount of 15% by weight or less on the basis of the support.” See page 3, Paragraph 9 of the Action. To make up for this deficiency, the Examiner relies on Choca, stating that it would have been obvious to one of ordinary skill in the art to modify the catalyst of Fujikawa with the support of Choca in order to increase the size of the pore diameter of the support so that the desulfurization activity may increase by permitting diffusion of sulfur catalysts into the catalyst pores.

In response, Applicants traverse for the following reasons.

The presently claimed invention is not rendered obvious by the cited references, because there is no teaching, suggestion, motivation or other reason to combine Fujikawa with Choca. Moreover, Fujikawa teaches away from combination with Choca. “It is improper to combine references where the references teach away from their combination.” MPEP § 2145(X)(D)(2).

Specifically, Fujikawa teaches that the pore size of their support is 60 to 95 Å and that:

“[w]hen the average pore diameter thereof is larger than about 95 Å, the catalyst has a reduced internal-surface area of the pores although diffusion into the pores is satisfactory. The catalyst hence has a reduced effective specific surface area and reduced activity.” See paragraph [0070] of Fujikawa.

On the other hand, Choca teaches that the “average pore diameter increases with the amount of phosphorous introduced into the composition in its preparation.” See Abstract and column 2, lines 35-37 of Choca.

Therefore, Applicants respectfully submit that the catalyst of Fujikawa cannot be modified by the support of Choca to add phosphorous to achieve the presently claimed invention, because to do so would increase the pore size beyond what is permitted by Fujikawa. According to Fujikawa, this increase in pore size would reduce the internal surface area of the pores, reducing activity. Thus, the modification of Fujikawa’s catalyst by Choca’s support frustrates Fujikawa’s intended purpose of producing a highly efficient catalyst for hydrotreating a gas oil fraction. See page 2, paragraph 20 of Fujikawa. Therefore, Applicants submit that Fujikawa cannot be combined with Choca, because Fujikawa teaches away from combination of Choca.

The presently claimed invention is not rendered obvious by the proposed combination of Fujikawa and Choca for at least this reason.

However, even if there is sufficient motivation to modify Fujikawa with Choca, *arguendo*, Applicants respectfully submit that the presently claimed invention provides unexpectedly superior results which rebut any *prima facie* case of obviousness and confirm the patentability of the invention.

It is a feature of the presently claimed invention to have phosphorous oxide contained by the support. Specifically:

“When the content of the phosphorus oxide is 15% by weight or lower, the sites on the alumina surface on which molybdenum disulfide is arranged are not narrowed. As a result, sintering (aggregation) of molybdenum disulfide does not occur, the area of the edges of molybdenum disulfide crystals does not diminished, and absolute number of CoMoS phases and NiMoS phases as desulfurization active sites does not decrease, so a high

desulfurization activity can be maintained.” See paragraph [0009] of the present specification.

Applicants respectfully submit that catalyst b, which corresponds to Comparative Example 2, is closely related to Fujikawa, and therefore a comparison between catalyst H of the presently claimed invention and catalyst b is both appropriate and illustrative of the unexpected results demonstrated by the presently claimed invention:

Property	Catalyst b (see page 45 of the specification)	Fujikawa (see Abstract)
Pore Volume	0.69 ml/g	0.35-0.6 ml/g
Specific Surface Area	364 m ² /g	220-300 m ² /g
Pore Diameter	64 Å	65-95 Å

When the catalyst H of the presently claimed invention is compared with the catalyst b of Comparative Example 2, the support used for the catalyst H contains phosphorous while the catalyst b uses a gamma-alumina support containing no phosphorous. See page 44, lines 20-21 and page 45, line 25 of the specification.

When a liquid containing phosphorous is deposited on each of the supports, the difference between I_{\max} and I_{\min} in the catalyst b is bigger than the difference in the catalyst H, and phosphorous in the catalyst H embodying the invention is less uneven and is uniformly present as compared with catalyst b as will be apparent from the measured results of EPMA in Table 1 (reproduced in relevant part below from page 49 of the present specification):

	Chemical property					Physical property				EPMA			S
	Amount of supported component				P ₂ O ₅ / MoO ₃	SA [m2/g]	PV [ml/g]	MPD [Å]	MPD ±15Å [%]	lave.	Imax.	Imin.	
	Catalyst	CoO	MoO ₃	P ₂ O ₅									
b	5.0	22.0	2.8	3.2	0.12	230	0.44	85	83	9.7	31.7	3.3	7.7
H	5.2	21.0	0.9	3.1	0.12	260	0.40	74	79	19.1	21.8	16.1	2.3

As mentioned in Table 2, it is understood that desulfurization specific activity is higher in the catalyst H embodying the invention than for comparative catalyst b. See page 54 of the specification. That is presumably because in the catalyst H phosphorous is previously contained in a support, whereby the interaction of the supported active metal with the support is weakened, and a Type II phase such as a CoMoS phase or an NiMoS phase, which is a highly active desulfurization site, is formed. On the contrary, in the catalyst b, the interaction of phosphorous or active metal with the support is too strong, whereby it is likely that a highly active desulfurization active site is hardly formed. This unexpected result is obtained by the presently claimed invention would not have been expected based on Fujikawa in view of Choca.

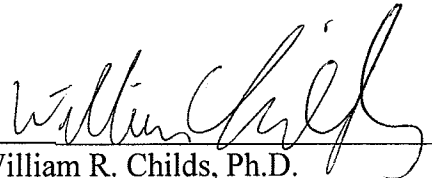
In view of the above, it is apparent that the presently claimed invention is not rendered obvious by the proposed combination of Fujikawa and Choca.

Reconsideration and withdrawal of the §103(a) rejection are respectfully requested.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "William R. Childs", written over a horizontal line.

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